

AMENDMENTS TO THE CLAIMS

What is claimed is:

1. (Three Times Amended) A system for controlling and monitoring a reciprocal pump (110) producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising:

(A) a data gathering system to generate a signal representative of a surface operating characteristic of the pumping system;

(B) a processor (130) in communication with the data gathering system, wherein the processor includes software that when executed utilizes the signal representative of the operating characteristic to determine a surface card, to determine a downhole card, and to generate a graphics signal (131) representative of at least one card of the surface card and the downhole card, and wherein the processor further comprises software that utilizes said least one card for generating a pump control signal (132); and

(C) a permanently installed output system (140) at said processor and in communication with the processor, which upon receipt of the graphics signal from the processor provides a viewable graphical representation of said ~~at least one card~~ surface card and said downhole card on a regular and on-going basis as part of the normal operations of the system, wherein for the viewable graphical representation an axis on the surface card representing position is at a same scale as an axis on the downhole card representing position.

2. (Previously Amended) The system of claim 1, wherein the pump control signal (132) is provided directly or indirectly to the pump for automatic control of the pump or provided to a human operator for human control of the pump.

3. (Previously Amended) The system of claim 1, wherein the graphics signal (131) generated by the processor is representative of both the surface card and the downhole card.

4. (Previously Amended) The system of claim 3, wherein said surface card and said downhole card are presented on common x-y axes representing rod (12) load and position.

5. (Previously Amended) The system for controlling and monitoring of claim 4, wherein said pump control signal is generated in real time within 12 hours of generating said signal representative of said surface operating characteristics.

6. (Previously Amended) The system for controlling and monitoring of claim 4, wherein said pump control signal is generated in real time within two cycles of the pump after generating said signal representative of said surface operating characteristics.

7. (Three Times Amended) A method of monitoring a reciprocating pump (110) producing hydrocarbons from a wellbore extending from the surface into the subterranean, the method comprising the steps of:

(A) producing a signal representative of an operating characteristic of the well at the surface;

(B) generating ~~at least one card of a surface card and~~ a downhole card utilizing the signal representative of said operating characteristic;

(C) displaying a viewable graphical representation of said ~~at least one~~ downhole card on an output system (140) which is permanently positioned in association with said pump (110) on a regular and on-going basis as a part of a normal operation of the method.

8. (Twice Amended) The method of claim 7, further comprising the step of

(D) generating a pump control signal in response to a characteristic of said ~~at least one~~ downhole card.

9. (Previously Amended) The method of claim 8, wherein said steps (C) and (D) occur within twenty-four hours of said step (A) of monitoring said signal representative of an operating characteristic.

10. (Previously Amended) The method of claim 8, wherein said steps (C) and (D) occur within 10 reciprocations of the pump (110) after said step (A) of monitoring said signal representative of an operating characteristic.

11. (Previously Amended) The method of claim 8, wherein said steps (C) and (D) occur within 1 reciprocation of the pump (110) after said step (A) of monitoring said signal representative of an operating characteristic.

12. (Previously Amended) The method of claim 8, further comprising the step of,
(E) providing the control signal directly or indirectly to the pump.

13. (Previously Amended) The method of claim 12, in which step (D) includes the step of comparing a shape of said downhole card to a shape of an ideal downhole card that is representative of an operating condition of the pump.

14. (Previously Amended) The method of claim 13, further comprising:
(F) cyclically performing the steps (A), (B), (C), (D), and (E) while said pump is reciprocating.

15. (Three Times Amended) A system for controlling and monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising,

a computer arranged and designed to receive data regarding an operating characteristic of the pump, the computer including software that when executed instructs the system to perform the steps of:

(A) monitor a signal representative of an operating characteristic of the well at the surface;

(B) generate ~~at least one card~~ of a surface card and a downhole card utilizing the operating characteristic;

(C) generate a pump control signal based on a characteristic of said ~~at least one downhole~~ card; and

(D) provide a viewable graphical representation of said ~~at least one surface card and said downhole card~~ on a permanently positioned output system of the computer on a regular and on-going basis as part of the normal operations of the system, wherein for the viewable graphical representation an axis on the surface card representing position is at a same scale as an axis on the downhole card representing position.

16. (Previously Amended) The system of claim 15, wherein instructions (C) and (D) occur in near real time, relative to instruction (A) of monitoring said signal representative of an operating characteristic.

17. (Original) The system of claim 16, wherein near real time comprises within 24 hours.

18. (Original) The system of claim 16, wherein in near real time comprises within 10 reciprocations of the pump.

19. (Original) The system of claim 16, wherein in near real time comprises within 1 reciprocation of the pump.

20. (Previously Amended) The system of claim 15, wherein said software that when executed further instructs the system to:

(E) provide the pump control signal directly or indirectly to the pump.

21. (Three Times Amended) The system of claim 15, in which instruction (C) generates said pump control signal by ~~compares~~ comparing a shape of said downhole card to a shape of an ideal downhole card that is representative of an operating condition of the pump.

22. (Three Times Amended) The system of claim 21, where said software that when executed further instructs the system to:

(F) cyclically perform said steps (A), (B), (C), (D) of claim 15, and (E) of claim 21 20.

23 - 38. (Previously Cancelled)

39. (Three Times Amended) A system for monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising:

(A) a data gathering system (120) to monitor a surface operating characteristic of the pumping system;

(B) a processor (130) in communication with the data gathering system, wherein the processor comprises software that when executed utilizes the operating characteristics to determine a surface card, determines a downhole card, and generates a graphics signal representative of ~~at least one card~~ of the surface card and the downhole card; and

(C) an output system permanently positioned at said processor and (140) in communication with the processor, which upon receipt of the graphics signal from the processor provides a viewable graphical representation of the graphics signal on a display screen on a regular basis as part of normal operations of the pump (110), wherein for the viewable graphical representation an axis on the surface card representing position is at a same scale as an axis on the downhole card representing position.

40. (Previously Amended) A method of monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the method comprising the steps of:

(A) monitoring an operating characteristic of the well at the surface;

(B) generating a surface card utilizing the operating characteristics;
(C) generating a downhole card based upon said surface card; and
(D) generating on a display screen permanently positioned in proximity of said pump on a regular basis as part of normal operation of the pump (110) a viewable graphical representation of both the surface card and the downhole card, wherein for the viewable graphical representation an axis on the surface card representing position is at the same scale as an axis on the downhole card representing position.

41. (Previously Amended) The method of claim 40, wherein step (D) of generating a viewable graphical representation occurs in near real time, relative to step (A) of monitoring an operating characteristic.

42. (Previously Amended) The method of claim 41, wherein the near real time comprises within 24 hours.

43. (Previously Amended) The method of claim 41, wherein in near real time comprises within 10 reciprocations of the pump.

44. (Previously Amended) The method of claim 41, wherein in near real time comprises within 1 reciprocation of the pump.

45. (Previously Amended) The method of claim 40, further comprising:

(E) adjusting the operation of the pump if warranted based on the surface card and the downhole card.

46. (Previously Amended) The method of claim 45, in which step (E) first comprises comparing the downhole card to ideal downhole cards.

47. (Previously Amended) The method for monitoring of claim 45, further comprising:

(F) repeating steps (A), (B), (C), (D), and (E).

48. (Previously Amended) A system for monitoring a reciprocating pump producing hydrocarbons from a wellbore extending from the surface into the subterranean, the system comprising

a computer receiving data regarding an operating characteristic of the pump, the computer including software that when executed instructs the system to:

- (A) generate a surface card utilizing the operating characteristic;
- (B) generate a downhole card based upon said operating characteristic; and
- (C) generate a viewable graphical representation of both the surface card

and the downhole card on a display screen permanently placed in proximity to the pump, wherein for the viewable graphical representation an axis for the surface card representing position is at the same scale as an axis for the downhole card representing position.

49. (Previously Amended) The system of claim 48, wherein instruction (C) to generate a viewable graphical representation occurs in near real time.

50. (Previously Amended) The system of claim 48, wherein in near real time comprises within 4 hours.

51. (Previously Amended) The system of claim 48, wherein in near real time comprises within 2 reciprocations of the pump.

52. (Previously Amended) The system of claim 48, wherein in near real time comprises within 1 reciprocation of the pump.

53. (Previously Amended) The system of claim 48, wherein said software further instructs the system to:

- (D) generate a control signal to adjust the operation of the pump if warranted based on a characteristic of at least one card of said surface card and said downhole card.

54. (Previously Amended) The system of claim 53, in which said software generates said control signal by comparing the downhole card to at least one ideal downhole card.

55. (Previously Amended) The system of claim 53 wherein said software further instructs the system to:

(E) cyclically repeat said steps (A), (B), (C), and (D).

56-104. (Previously Cancelled)